



SAN BERNARDINO MICROWAVE SOCIETY, Incorporated

FOUNDED IN 1955

A NON-PROFIT AMATEUR TECHNICAL ORGANIZATION DEDICATED
TO THE ADVANCEMENT OF COMMUNICATIONS ABOVE 1000 MC.

W6IFE Newsletter March 2012 Edition

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At the **March 1, 2012 SBMS meeting** Wattmeter session to check the calibration of your power reading devices. Doug, K6JEY will have available an accurate means of measuring to 1.5% of reading at the 10, 50 and 100 watt levels on 432 and 1296 MHz. This is different than most meters that are some percentage of full scale. So bring your power measuring units to the meeting to get them checked. Doug will have terminations available for through type meters. If you have a low range meter such as an HP 431 type meter there will be 30 dB attenuators to put in front of your instrument. The SBMS meets at the American Legion Hall 1024 Main Street (south of the 91 freeway) in Corona, CA at 1900 hours local time on the first Thursday of each month.

Last meeting- Brian, AF6NA talked about the 1994 Ducting Paper EREPS by Ed Munn. Several types of ducting were discussed: sub-reflection, standard, super refraction, and trapping. Evaporative ducting over water was what the European team used to set the last record. The 2011 10 GHz and Up contest results were out on the ARRL web site. Pat, N6RMJ was number one in number of QSO's and number 2 in points for the 10 and 24 GHz entries. Mel, WA6JBD had the highest DX at 840 KM. Walter Clark had a demo of a noise source driven by a LM 555. Kurt, K6RRA had some SDR boards to show for a 40 meter rig.

Scheduling:

March 3-4 Dubus EME 432 MHz & 3.4 GHz 00-24z

March 31- Apr 1 Dubus EME 144 MHz & 10 GHz 00-24z

April 21-22 Southeastern VHF Society Conference Charlotte, NC www.svhfs.org

Apr 28-29 Dubus EME 2.3 GHz 00-24z

May 5-6 SBMS 2 GHz and Up Club Contest

May 26-27 Dubus EME 1.2 GHz 00-24z

June 9-10 ARRL June VHF QSO Party

June 23-24 Dubus EME 5.7 GHz 00-24z

June 24-27 Society of Amateur Radio Astronomers 2012 Conference National Radio Astronomy Observatory Green Bank, WV. www.radio-astronomy.org

August 4-5 ARRL August UHF Contest

August 18-19 ARRL 10 GHz and Up contest part 1

August 16-19, 2012 The 15th International EME Conference in Cambridge, England.

September 8-10 ARRL September VHF QSO Party

September 15-16 ARRL 10 GHz and Up Contest part 2

October 18-21 Microwave Update 2012 in Santa Clara Biltmore Hotel

Wants and Gots for sale.

For Sale: 30w 1296 MHz PA kit \$50 + \$5 for US shipping Chris Shoaff, N9RIN cshoaff@yahoo.com

For Sale: 10 GHz slotted waveguide antennas \$55 kit, \$80 assembled plus shipping Dan W6DFW W6DFW@apex-scientific.com

For Sale: table mounted wood router \$15; 16 element 2 meter skeleton slot antenna, \$10; 8 ft solid aluminum dish, \$50 (can transport to your site for mileage.); 6 ft fiberglass dish \$10; 7.5 ft TVRO dish \$10; 6ft motorized Az/El RV TVRO dish with control box \$20; 10 ft TVRO mesh dish free; 10 to 20 ft aluminum thin wall pipe diameters from 1 inch to 4 inch (old HF full size beam parts); 120v 20a variac \$20; Struthers RF Directional Wattmeter with 3 slugs (2-30 MHz, 25-250 MHz, 200-1000 MHz) each slug has 10, 50, 100, 500 w ranges, \$75; Roll-a-round camera mount with quickset head \$25 Bill WA6QYR bburns@ridgenet.net 760-375-8566.

For Sale- lots of microwave stuff. Let me know what you need. John KJ6HZ 951-288-1207.

Wanted- 30-40 dB 25-50w attenuator W6IEE.73@gmail.com

For Free- four 4 ft channel master dishes Pat, N6RMJ 661-755-1773 n6rmj@sbcglobal.net.

For Sale – new SMA attenuators DC-18 GHz 6dB and 20 dB \$5 each Dick 714-529-2800 rabremer@juno.com.

If you have some extra change and want a great location and a huge dish, then read:

<http://www.nytimes.com/2012/02/10/us/jamesburg-earth-station-can-be-yours-for-3-million.html>.

Activity reports: Dave, WA6CGR had fixed two HP141 spectrum analyzers, had a Fun Dongle, had a WEMO that he was working on at Belkin and reported that the Lab now has acalibrated 47 GHz noise source; Larry, K6HLH worked on his 2 and 3 ghz rigs; Jason, W6IEE has a Fun Dongle and went to the Desert Hamfest; Mel, WA6JBD got his 10 GHz rig out to work Jason at the Hamfest; Jeff, KN6VR did some 1296 MHz antenna work; Eric, AF6ET did some wifi work; Kurt, K6RRA cleaned his garage; John, KJ6HZ bought a Fun Dongle; Tom WB6UZZ machined some stuff for Brain; Courtney, N5BF did some HF work; Walt Clark talked about some sun work at 1480 MHz; Dick, WB6DNX sent the NEC projector in for some adjustments; Brain, AF6NA built a cone antenna as a Smart meter redirector for folks concerned about the RF coming from the Smart meters. ATV inputs came from KB6CJZ, WB6NOA, and AC6CBZ and 9 others checked in on internet. 17 people present.

The 15th International EME conference will be held at Churchill College Cambridge, in August 2012. The University City of Cambridge is a world famous center of scientific learning that has played a major part in mankind's scientific advances. The conference will take place on Friday 17th and Saturday 18th August 2012, culminating in the conference dinner on Saturday evening. Before the conference there will be an optional tour on Thursday 16th visiting Bletchley Park, the WW2 code breaking center and home of the world's first computer, a working replica of which can be seen. On Saturday, for partners, there will be a tour to the historic town of Saffron Walden and a visit to the historic house and garden at Audley End. The two main conference days will feature a full program of lectures, the usual test and measurement facilities and displays of EME- related hardware and software products. Accommodation has been booked at the conference venue, and is available to delegates from the afternoon of Wednesday 15th, (before the pre-conference tour) through to the morning of Sunday 19th August. A range of inclusive packages is being offered so that delegates can book accommodation according to their needs. For more information, please visit the web site of the conference at eme2012.com.

Parabolic Antenna information.

In February there was a thread running on the east coast microwave reflector discussing the various points of a parabolic reflector type of antenna. Most of the discussion related more to EME type concerns that what terrestrial folks would be concerned with. Some generalities were being bantered about on what the ball park should be for some quantities.

The figure below shows a parabolic as seen for the side so you can measure it and to be able to calculate some properties. D is the diameter of the dish which is usually measured by a tape measure across the open side. The full distance of the circle is its diameter, not including the rolled edge or bent edge work. The radius of the dish is just half of the diameter. The depth of the dish is measured from that straight edge placed across the open side of the dish to the vertex (or back) of the dish. Using these two dimensions one can figure out the position of the focus using $f = \text{radius squared} / \text{depth times 4}$.

The gain of the dish can be calculated by using 4π times the area of the dish times the efficiency of the dish divided by the wavelength squared. The area being equal to 4π times the diameter. This assumes an efficiency of 1 whereas most dishes are in the 50% efficiency. This gain will be a number that you will want to convert in to decibels by $10 \log$ to the base 10 of the gain number. To get better efficiency one would want to go to the off-set feed type of antenna where the efficiency is in the 70 to 80% range.

The maximum gain is usually where the feed horn has a uniform illumination across the dish and tapers to 10 dB down at the edge of the dish. Radio astronomers use a taper of 20 dB down at the edge of the dish to keep spill over from seeing the warm ground behind the dish. The normal figure one sees about a feed horn is its 3 dB beam width in degrees. Here we are talking about the point in the feeds pattern where it is 10 dB down from the main on axis gain. For terrestrial work it usually isn't of concern since you will be looking at the ground to some degree when you point the dish at the horizon. For best performance one would want the feed 10 dB beam width to match the dish diameter.

Most of us get our dishes from surplus or a friend. These usually have seen some banging during its life. So how many dings and dents can we tolerate in our dish? The usual ding size where it becomes a problem is that the dings don't want to be more than the wavelength divided by 40 deep. Smaller is better but you can tolerate some dings. The surface of the dish wants to be smooth and conform to the parabolic shape. If the shape deviates more than the wavelength over 40 figure then the dish isn't to useful. Some dishes are more spherical and therefore not as useful. If like some that have been around a while and maybe had some heaters attached to the back of the dish, how big a hole can you tolerate in the surface of the dish? The usual number here is one tenth of a wave length. Again if there are many big holes the dish isn't going to have all the gain you want. Checking out your old C-band TVRO dish you can check the hole size in the expanded metal screen to see if it meets the criteria for the band you wish to work on. Most holes are smaller than the figure for the 3-4 GHz frequency they used the dish for in TVRO operations. If you got a solid dish you are lucky to use it as high as the deformity, dings and holes will allow it to go.

When trying to measure the parameters of your dish you want to have your signal source out in the far field region of the dish which is 2 times the diameter squared divided by the wavelength. The sun is a good source way out in the far field region of any dish if you have the receiver sensitivity to see it. A good antenna range to measure a dish on is an elevated one where the test dish is up in the air looking down at the source antenna. You don't want a bunch of reflectors in the area, like other buildings or cars. The test antenna and the source want to be at a distance of far field. You rotate the test dish in azimuth to record the signal strength as it moves. You set the main lobe of the test dish as max gain when pointing at the source and the pattern made as it rotates is that shape of the gain for those angles. If there are reflections from objects between the two antennas, sometimes a fence is placed to mask those reflections.

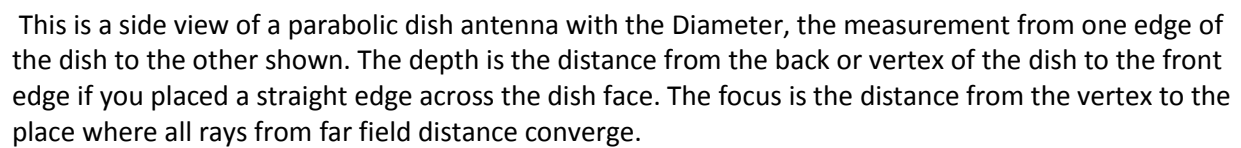
Another antenna range is the indoor anechoic chamber which is a big room with absorber on the walls, floor and ceiling. The source antenna is on one end of the room. At the far field distance from the source is the test antenna. Again the test antenna is placed up on a rotating table that can move in azimuth. The pattern is taken in a similar manner of setting the main lobe of the dish on the direct path between the two antennas and as the test dish is rotated a pattern versus angle is plotted out on a receiver/recorder. This chamber is only as good as the absorber on the walls. The signal source can be made larger in dB or receiver more sensitive, but if the signal bounces off the walls you will get a problem pattern.

As your system gets better noise figure and sensitivity you may wish to look at other parameters that tend to degrade your antenna. How you hold the feed in place can affect the system gain. If you have large rods holding the feed they will cause some blockage of signals passing by them. Making the supports out of a dielectric material will help. Of course the feed itself will cause some blockage. The only way to get around feed blockage is to go to an off-set dish. Placing radio wave absorber on the support rods will only increase the noise seen by the receiver and absorb some of the transmit energy. One dish that was brought in to an SBMS meeting had a waveguide Sheppard's crook feed. The guide leading out to the feed horn was covered with absorber to reduce the scatter from the guide. For a low noise system the absorber would only add to the noise figure of the system. .

If your feed return loss is degraded (hard to measure this) by placing it in the dish, then the one way to reduce the reflections is to put a vertex plate at the back of the dish. This is a small thin (thickness on the order of 4 hundredths of a wavelength) plate described in Jasik on page 30-15. The other way is to go to the off-set feed antenna.

Another parameter that is measured in directive antennas is the front to back ratio. Jasik gives a simplified answer being just the dish gain plus 7.

A resource is the "Antenna Engineering Handbook" second edition by Johnson and Jasik. Another is "The ARRL UHF/ Microwave Experimenters Manual". An on line source of good information is Paul Wade's "W1GHZ Online Microwave Antenna Book" at www.w1ghz.org/antbook.





Brian, AF6NA with his Smart Redirector at the February SBMS meeting.

The San Bernardino Microwave Society is a technical amateur radio club affiliated with the ARRL having a membership of over 90 amateurs from Hawaii and Alaska to the east coast and beyond. Dues are \$15 per year, which includes a badge and monthly newsletter. Your mail label indicates your call followed by when your dues are due. Dues can be sent to the treasurer as listed in the banner on the front page. If you have material you would like in the newsletter, please send it to Bill, WA6QYR at 247 Rebel Road

Ridgecrest, CA 93555 or, bburns@ridgenet.net, or phone 760-375-8566. The newsletter is generated about the 15th of the month and put into the mail at least the week prior to the meeting. This is your newsletter. SBMS Newsletter material can be copied as long as SBMS is identified as source.

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